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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/733,984	12/11/2003	Hui-Min Mao	10113311	2073
34283 7590 12/21/2006 QUINTERO LAW OFFICE, PC 2210 MAIN STREET, SUITE 200 SANTA MONICA, CA 90405			EXAMINER MONDT, JOHANNES P	
			ART UNIT	PAPER NUMBER
			3663	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		12/21/2006	PAPER	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/733,984

Applicant(s)

MAO ET AL.

Examiner

Johannes P. Mondt

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12 October 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 23-27 is/are pending in the application.
- 4a) Of the above claim(s) 27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 23-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Amendment***

Amendment filed 120/12/06 forms the basis for this action. In said Amendment applicant substantially amended all outstanding, elected claims 23-26 through substantial amendment of independent claim 23. Comments on Remarks are included below under "Response to Arguments".

### ***Information Disclosure Statement***

The examiner has considered the items listed in the Information Disclosure Statement filed 10/03/06. A signed copy of Form PTO-1449 (modified) is herewith enclosed.

### ***Claim Rejections - 35 USC § 112***

1. ***Claims 23-26*** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. In particular, a passivation layer "conformally formed on the inner landing pad" has not been disclosed in any final structure (such as Figure 1I, although it is disclosed in an intermediate step such as Figure 1F in applicants' Specification).

### ***Claim Rejections - 35 USC § 102***

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The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 23 and 25** are rejected under 35 U.S.C. 102(b) as being anticipated by Hong (5,966,600). Hong teaches a structure for a bit line contact hole comprising:

A substrate 10 (col. 4, l. 8); a transistor (FET), disposed on the substrate, comprising a gate layer 22 (col. 6, l. 15-20) covered by a first insulating layer 30 (col. 5, l. 66) and comprising a doped region (34, 36) (Figure 6, col. 6, l. 15-46), an inner landing pad 44 (col. 7, l. 29-48), disposed on the doped region and (on) parts of the transistor, comprising a polysilicon layer 44 (loc.cit.); a passivation layer 50 (inherently by material constitution, i.e., silicon nitride, serving as diffusion barrier) (col. 8, l. 13-15 and Figure 5) serving as a diffusion barrier, conformally formed on the inner landing pad, the transistor and the substrate (Figures 5-6); a second insulating layer comprising doped materials 54 (BPSG: see col. 9, l. 5-8) comprising doped materials (boron being a dopant in doped material PSG), disposed on the passivation layer (Figures 5-6), having a flat surface on said passivation layer (Figures 5-6); a contact plug 56 (Figure 6 and col. 9, l. 8-14), disposed on the second insulating layer and the passivation layer and contact with the inner landing pad (Figure 6), electrically connected with the inner

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landing pad (by abutting said inner landing pad); and interconnected landing pad 58 (col. 9, l. 11-14), deposited on the contact plug (Figure 6).

*On claim 25:* the material of the passivation layer comprises silicon nitride (col. 8, l. 13-19).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. ***Claims 24 and 26*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hong (5,966,600).

As detailed above, Hong anticipates claims 23 and 25. Furthermore,

*On claim 24:* the thickness of the polysilicon layer 44 of the inner landing pad 44 is "about 500 – 1500 angstrom" (col. 6, l. 55-56), hence also "about 100-400 angstrom" as claimed, because "about" means approximately and the specification does not provide a measure of precision with which "about" is to be interpreted. Applicant is reminded in this regard that a *prima facie* case of obviousness typically exists when the ranges as claimed overlap the ranges disclosed in the prior art or when the ranges as claimed do not overlap but are close enough such that one skilled in the art would have

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expected them to have the same properties. In re Peterson, 65 USPQ2d 1379 (CA FC 2003).

*On claim 26:* the thickness of the passivation layer is between about 35 and 65 angstroms (loc.cit.), which, given the claim language “about” in “about 110-130” angstroms at least presents a case of prima facie obviousness for the same reasons as provided above in the discussion of claim 24.

4. **Claim 23** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tu (6,100,138) (as cited in previous office action), in view of Blosser et al (6,979,640 B1) and Tsai et al (US 2004/0021473 A1).

*Tu teaches* a structure for a bit line contact hole (col. 4, l. 13-15) comprising: a substrate 100; a transistor (with gate 104/106 and source/drain regions 115) (col. 3, l. 62 – col. 4, l. 3), disposed on the substrate (Figures 11A,B), comprising a gate layer 104/106 ((loc.cit.) covered by a first insulating layer 102 (col. 3, l. 67 – col. 4, l. 1) and comprising a doped region 115 (source/drain regions; see col. 3, l. 62-66); an inner landing pad 120a (col. 4, l. 25-54), disposed on the doped region 115 and parts of the transistor (e.g., on the gate stack 104/106 and the gate insulating layer 102) (Figure 11A), comprising a polysilicon layer (col. 4, l. 41-43);

a passivation layer 135a (col. 4, l. 56-59) *capable* of serving as a barrier layer (col. 4, l. 55-58), conformally formed on the inner landing pad 120a (see Figure 5A: both 120a and 135a are straight; “formed on” does not imply “abut”), the transistor, and the substrate;

a second insulating layer 160 (Figures 3A; col. 4, l. 55-64), disposed on the passivation layer (Figures 11A,B), having a flat surface (cf. Figure 11A,B: straight horizontal lower main surface of portion of 270 protruding out of contact plug) on the passivation layer (Figures 11A,B);

a contact plug, i.e., 240/260 filled with 270 material laterally between 240 and hence higher and in contact with, - hence "on" said second insulating layer 160 (Figures 11A,B) and the passivation layer (Figures 11A,B) and contacted with the inner landing pad 120 (Figure 11A), electrically connecting with the inner landing pad (through 240 abutting 120); and

an interconnected landing pad on the contact plug (concave portions of 270 extend laterally outward from the contact plug beyond the boundaries of 240).

Tu does not necessarily teach the second insulating layer to comprise doped materials. However, it would have been obvious to include boro-phosphosilicate (BPSG), - which comprises doped materials boron and phosphor, as a material selection for said second insulating layer 160 because said second insulation layer 160 is a "nitride capping layer serving as hard mask" (see Tu, col. 5, l. 44-46), while it would have been obvious to select either BPSG or nitride as material for capping layer in view of Blosser et al, who, in a patent on interconnect structures for inter alia memory devices, hence analogous art, teach that for capping layers nitride and BPSG are equivalent material selections (col. 4, l. 62 – col. 5, l. 25). Furthermore, in view of Tsai et al, drawn to a patent application on MOS transistor based memory devices (abstract

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and [0004]), hence analogous art, for hard masks nitride and BPSG are equivalent material selections ([0009]).

Applicant is reminded in this regard that it has been held that mere selection of known materials generally understood to be suitable to make a device, the selection of the particular material being on the basis of suitability for the intended use, would be entirely obvious. In re Leshin 125 USPQ 416.

Finally, the limitation that the passivation layer is "serving as a diffusion barrier" constitutes functional language. In reference to the "serving as a barrier layer" intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963).

5. **Claims 25-26** are rejected under 35 U.S.C. 103(a) as being unpatentable over Tu, Blosser et al and Tsai et al as applied to claim 23 above, in view of Hartner et al (6,043,529).

As detailed above, claim 23 is unpatentable over Tu in view of Blosser et al and Tsai et al. Tu also teaches, the passivation layer 135a to comprise a nitride layer. Tu does not necessarily teach said nitride layer to be a silicon nitride layer. However, it would have been obvious select silicon nitride in view of Hartner et al, who, in a patent on a storage element for a semiconductor memory configuration (col. 1), hence analogous



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art, teach the selection of a silicon nitride layer 4 (col. 5, l. 18) between a lower electrode 5 (col. 5, l. 12; similar to lower electrode 240 in Tu) and a silicon oxide comprising dielectric layer 2 (col. 5, l. 1; similar to 130 in Tu) (see Figures 1-2 and col. 4, l. 65 – col., 5, l. 67). Therefore, Hartner et al show that silicon nitride has been recognized in the prior art to be a suitable material for the structural component 135a in Tu. It has been held that mere selection of known materials generally understood to be suitable to make a device, the selection of the particular material being on the basis of suitability for the intended use, would be entirely obvious. In re Leshin 125 USPQ 416.

*On claim 26:* the thickness, i.e., between 15 and 50 nm, i.e., between about 150 and 500 Å, of the passivation layer 135a in Tu (see col. 4, l. 60-62) meets the claim limitation because “about” means “approximately”. For instance, 140 Å is both about 130 and about 150 Å, and hence included in both the range as claimed and the range found in the prior art.

### ***Response to Arguments***

Applicant's arguments filed 10/12/06 have been fully considered but they are not persuasive. In particular, the newly introduced limitation that the passivation layer (122) is “conformally formed” on the inner landing pad (112a) is disclosed only as intermediate step (Figure 1F) rather than in a final structure (such as Figure 1I). Therefore, the newly introduced limitation forms new matter.

Second, Tu as cited does disclosed passivation layer 135a to be conformally formed on inner landing pad 120, as disclosed in Figure 5A, showing process results (col. 5, l. 14-23), and therefore the new claims stand rejected over the prior art as cited.

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In this respect it is noted the both 120a and 135a have the form of a rectangular slab and has have the same form ("conformal" meaning "having the same shape" [see Merriam-Webster's Collegiate Dictionary, tenth Edition, page 242]).

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Hong (5,966,600) (made of record through IDS).

Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on 10/03/06 prompted the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 609.04(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P. Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack W. Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JPM  
December 19, 2006

Patent Examiner:



Johannes Mondt (Art Unit: 3663)